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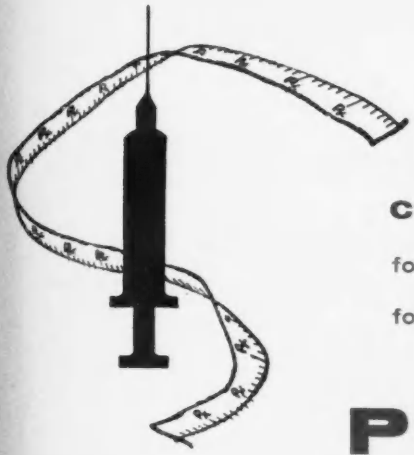

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Canadian Journal of
PUBLIC HEALTH

VOLUME 46 TORONTO, JUNE 1955 NUMBER 6

Recent Advances in Poliomyelitis of Interest to the Health Officer*

A. J. RHODES, M.D., F.R.C.P.(Edin.),
Director, The Research Institute
The Hospital for Sick Children
Toronto, Ontario

POLIOMYELITIS presents a considerable challenge to members of the Public Health profession, for, unlike some other infectious diseases, it appears to be on the increase. This increasing prevalence has been observed in many parts of the world, and under-developed countries which have never before experienced epidemics, are now reporting outbreaks. It seems as if an increase in the general standards of hygiene in these countries is accompanied by the emergence of poliomyelitis as an epidemic disease.

In countries such as Canada and the United States, where there have been epidemics for many years, there is also a tendency for the numbers of reported cases to increase. In Canada in 1953, there were over 9,000 reported cases, and in the Province of Saskatchewan the incidence was 128 per 100,000 (Kohn, 1954). The disease was also prevalent in Manitoba and other parts of western Canada. In Winnipeg, the attack rate was 318 per 100,000.

These figures surely indicate that there is no excuse for complacency about poliomyelitis! Yet precisely such an attitude has been characteristic of official public health in most countries during the last two decades, when the apparent failure of routine measures of control has led many administrators to reduce almost to nil the limitations placed on poliomyelitis cases and their contacts, who are therefore left free to disseminate the causal virus in their community.

*From the Department of Paediatrics, University of Toronto, and The Research Institute of The Hospital for Sick Children, Toronto, Canada. The research work of the author and his associates mentioned in this paper was assisted with funds allocated by the Province of Ontario under the National Health Grants program of the Department of National Health and Welfare, Ottawa.

Based on an address given at the annual meeting of the Saskatchewan Branch of the Canadian Public Health Association, Regina, April 12, 1955.

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Recently, there has been some heart-searching in regard to the wisdom of this attitude. For example, The Expert Committee on Poliomyelitis of the World Health Organization and the British Ministry of Health have suggested restrictions which are more stringent than those usually imposed. These regulations are based on the often demonstrated fact that acute poliomyelitis is a disease of high infectivity and communicability, and is spread essentially by human contact.

At a time when the present status of control by routine public health measures has come under scrutiny, great progress has been made in the field of active immunization, and a formol-treated vaccine prepared in tissue cultures of monkey kidney cells has been widely tested in the United States and Canada with satisfactory results.

It is my purpose to cover briefly in this paper, some of the more significant current trends in these two aspects. It is certain that in the future control of poliomyelitis, routine measures to restrict the spread of the virus and active immunization must go hand-in-hand. Control of infectious diseases by vaccination alone is unlikely.

The Newer Knowledge of Polio Virus: Cultivation in Vitro

For many years, poliomyelitis virus could be studied outside the human body only by inoculation of monkeys or chimpanzees. Then in 1939 came the discovery of Armstrong that the Lansing strain of poliomyelitis virus, now known to belong to Type 2, proliferates in mice. The Lansing strain was widely used, especially as antigen in serologic tests, and much additional information became available during the years 1939–1948.

On looking back, it is remarkable how much information was in fact gathered about poliomyelitis in the "monkey" and the "mouse" periods. For example, the distribution of the virus in the human body, and in the environment, and the basic facts of immunity were established. Yet progress, especially in laboratory diagnosis, in epidemiology, and in the development of a practical vaccine, was seriously restricted, because there was no simple and cheap means of growing the causal virus.

In 1948, the present or "tissue culture" era in poliomyelitis research was opened by the discovery of Enders, Weller, and Robbins that the virus can be grown in tissue cultures of human tissue. These observations were rapidly confirmed and extended, not only by the discoverers, but by virologists in many parts of the world.

Most of the original work was carried out in suspended cell cultures of minced human embryonic tissue in small flasks, and the presence of virus was inferred if the pH of the culture fluids did not fall as rapidly as in control uninfected flasks. This pH differential is a manifestation of the destructive effect of virus on cells, the cytopathogenic effect, that first reduces and eventually stops completely the metabolism of the minced tissue.

These flask cultures were soon superseded by fragment cultures in roller test tubes, in which small pieces of tissue are embedded in a plasma clot, and covered with a suitable nutrient. The tissues most commonly used for these cultures are human embryonic tissue, human uterus, kidney, or tonsil. Monkey

kidney and testis are also suitable. Nutrient media consist of balanced salt solution with animal sera and embryo extracts. In our own work, we have found very satisfactory the synthetic nutrient Medium 199 prepared from chemicals of known constitution, and introduced by Morgan, Morton, and Parker of the Connaught Medical Research Laboratories in 1950.

Recently, these fragment cultures have been replaced by more sensitive cultures of epithelium. In the technique introduced by Dulbecco and Youngner, monkey or human kidney is first treated with trypsin, to disperse the cells; the resultant growth of epithelium occurs in the form of a single layer or monolayer (Fig. 1).

Many workers favor the HeLa cell culture derived from a carcinoma of cervix, and pioneered by Syverton and his associates. These cultures can be subcultured indefinitely in the laboratory, thus obviating the necessity for obtaining fresh monkey tissue at frequent intervals (Fig. 2).

The cytopathogenic changes induced by poliomyelitis virus in cultures can be seen microscopically in wet preparations. For accurate study, it is pre-

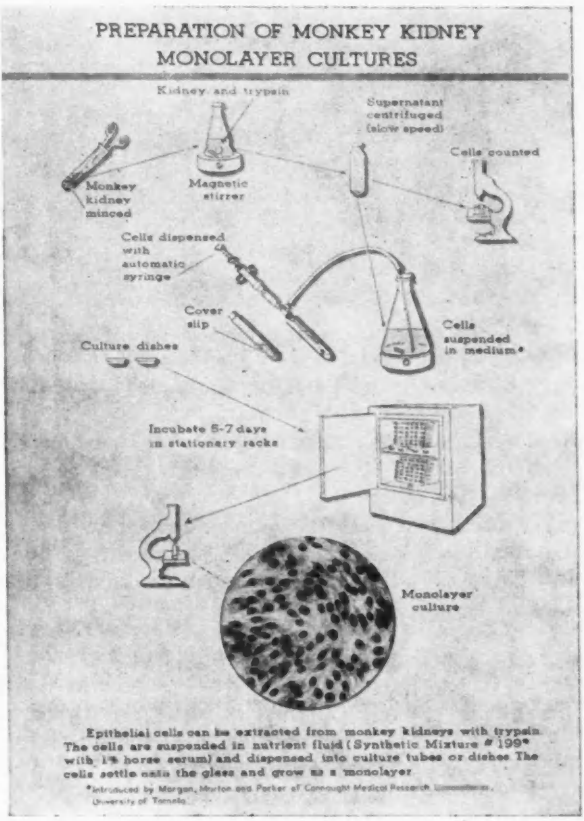
PREPARATION OF MONKEY KIDNEY MONOLAYER CULTURES
Kidney and trypsin
Supernatant centrifuged (slow speed)
Cells counted
Monkey kidney minced
Magnetic stirrer
Cells dispensed with automatic syringe
Cover slip
Culture dishes
Cells suspended in medium*
Incubate 5-7 days in stationary racks
Monolayer culture
Epithelial cells can be extracted from monkey kidneys with trypsin. The cells are suspended in nutrient fluid (Synthetic Mixture # 199* with 1% horse serum) and dispensed into culture tubes or dishes. The cells settle onto the glass and grow as a monolayer.
*Introduced by Morgan, Morton and Parker of Connaught Medical Research Laboratories, University of Toronto.

Figure 1

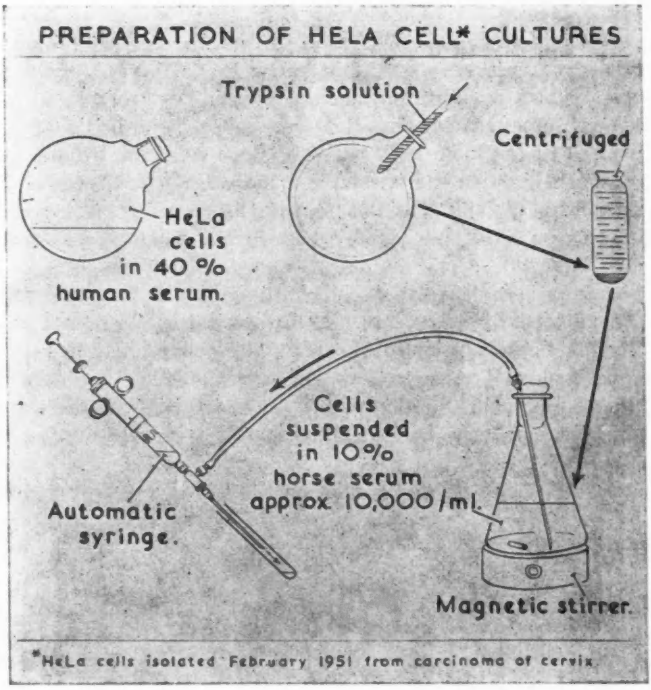
PREPARATION OF HELA CELL* CULTURES
Trypsin solution
Centrifuged
HeLa cells in 40 % human serum.
Cells suspended in 10% horse serum approx. 10,000/ml.
Automatic syringe.
Magnetic stirrer.
*HeLa cells isolated February 1951 from carcinoma of cervix.

Figure 2

ferable to grow the cultures on coverslips which are stained at a suitable time following infection.

Tissue cultures are now widely used for the isolation of poliomyelitis virus from pathologic specimens (Fig. 3), and for the typing of these strains into one or other of the three antigenic types (Fig. 4).

The distribution of the three antigenic types across Canada is shown in Fig. 4; of 117 strains collected in 1948–1954 and recently typed, the great majority (108) are seen to be members of Type 1.

These cultures can also be used for the measurement of poliomyelitis antibody in human serum or in gamma globulin. More recently, tissue cultures of monkey kidney have been employed in the mass production of poliomyelitis virus for processing into a vaccine.

The Laboratory Diagnosis of Poliomyelitis

The laboratory diagnosis of poliomyelitis has now been brought within the reach of public health and hospital laboratories, for it is within their capabilities to identify the virus in tissue cultures. There is no question that tissue cultures can replace monkeys for recovering poliomyelitis virus from pathologic specimens such as stool, throat washings, blood, or central nervous system.

In routine diagnosis, stool is most likely to yield virus, and in our recent

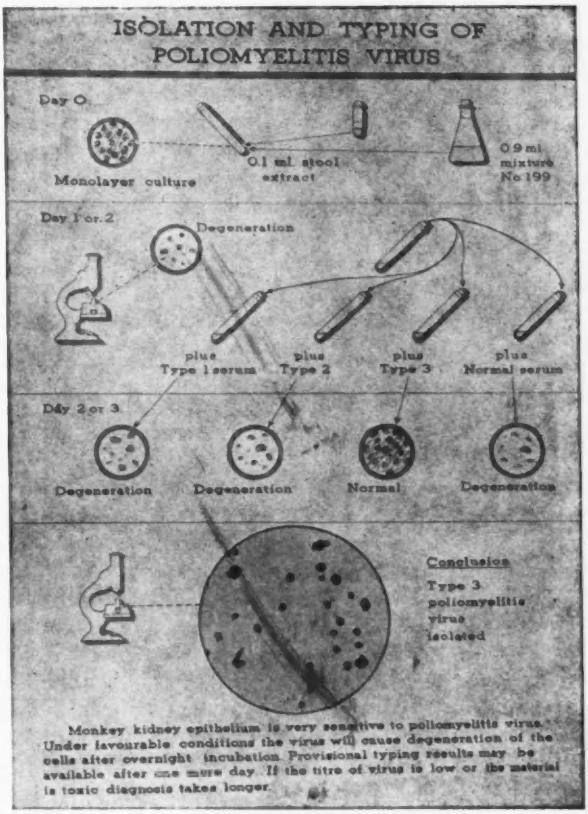
ISOLATION AND TYPING OF POLIOMYELITIS VIRUS
Day 0
Monolayer culture
0.1 ml. stool extract
0.9 ml. mixture No 199
Day 1 or 2
Degeneration
plus Type 1 serum
plus Type 2
plus Type 3
plus Normal serum
Day 2 or 3
Degeneration
Degeneration
Normal
Degeneration
Conclusion
Type 3 poliomyelitis virus isolated
Monkey kidney epithelium is very sensitive to poliomyelitis virus. Under favourable conditions the virus will cause degeneration of the cells after overnight incubation. Provisional typing results may be available after one more day. If the titre of virus is low or the material is toxic diagnosis takes longer.

Figure 3

experience, 75 poliomyelitis strains were recovered from the stools of 90 paralytics. This recovery rate of approximately 85% is comparable to that achieved earlier with monkeys. Recovery of poliomyelitis virus from the stools of cases of suspect non-paralytic polio has been much less frequent, about 25%, and this is a reflection of the fact that many other viruses cause illnesses clinically diagnosed as non-paralytic poliomyelitis. Nasopharyngeal specimens less commonly prove positive than stool specimens.

In my opinion, the eagerly-awaited laboratory diagnostic test for poliomyelitis is now available. This test depends on the isolation of a type poliomyelitis virus from stool or other specimen, and may be completed within three to four days. In some instances, admittedly, recovery of virus from stool may merely indicate an earlier infection, for virus may be excreted for weeks or even months after onset. However, in general, the recovery of virus from a patient with an acute illness, clinically consistent with poliomyelitis, constitutes laboratory confirmation. The final diagnosis, as always, has to be made by the attending physician who alone has all the relevant information.

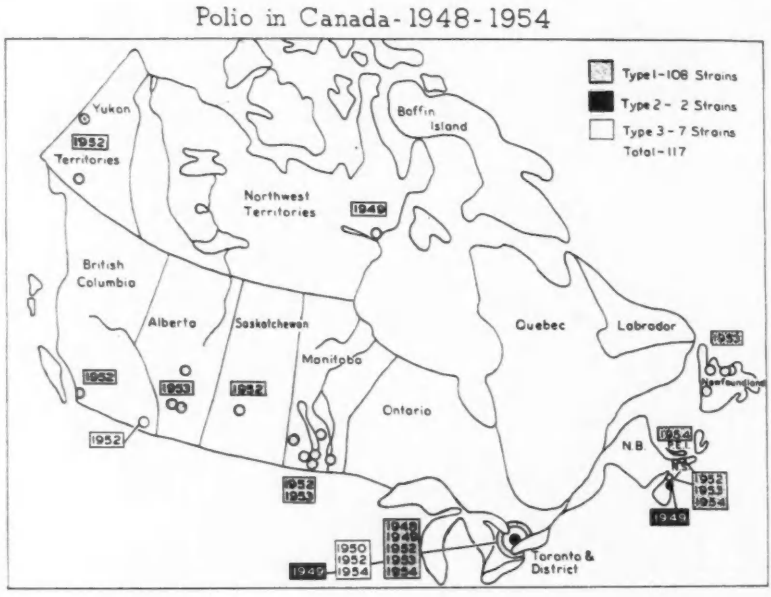

Figure 4

During the 1954 poliomyelitis season in Toronto, we were able on a number of occasions to carry out laboratory tests promptly, and thereby afford considerable assistance to the clinician. For example, Baby A.A. aged 4 months, suffered from paralysis. Type 1 virus was isolated from the stool, and the diagnosis of poliomyelitis at this early age thereby confirmed.

In patient T.W., aged 8, the diagnosis lay between Guillain-Barré syndrome and poliomyelitis. Failure to isolate virus from stool suggested the former diagnosis, and the rapid improvement in paralysis further tended to rule out poliomyelitis.

Patient A.L., aged 6, was admitted with a diagnosis of purulent meningitis, and was treated with antibiotics. Bilateral gluteal weakness was later detected, and poliomyelitis virus was isolated from the stool.

Serologic examination is of relatively little value in the diagnosis of poliomyelitis. Both the complement fixation and virus neutralization tests become positive early, and antibody titres are often similar in both acute and convalescent sera. Nevertheless, these tests should be performed in cases where the highest degree of accuracy in diagnosis is required, and in suspect cases of poliomyelitis when virus is not recovered from pathologic specimens.

New Concepts of the Pathogenesis of Poliomyelitis

For many years, it was held that poliomyelitis virus is a strict neurotrope, and spreads in the human body by passage along nerve fibers. Although some workers claimed that there is a phase of generalized infection, with

virus circulating in the blood, little or no proof of this was obtained. If the neurotropic theory is correct, and if poliomyelitis virus is indeed locked away inside the nervous system from shortly after penetration of the mucosal surface of the body, then the possibility of arresting spread is remote.

Further evidence in support of blood spread has recently been brought forward by Bodian and Horstmann, mainly on the basis of experiments in primates. These workers have shown that animals infected with poliomyelitis virus by feeding often develop viremia a few days later, during the incubation period.

It is postulated that virus enters the human body by the pharynx, multiplies first in the alimentary mucosa, then in the organs associated with the blood, and finally in the central nervous system. Virus circulates in the blood during the second or vascular phase, and disappears therefrom when antibody starts to develop.

It is probable that the sequence of events mentioned can be interrupted at any stage. Thus, in subclinical infections, virus may proliferate in the alimentary tract, but not spread further. Such proliferation is probably enough to lead to the development of serum antibody, and serves to boost any preexistent immunity. Virus may, however, escape from the site of primary multiplication and reach the blood and associated organs. Here, likewise, further spread may be arrested. An infection of this type is probably associated with an abortive or minor illness. Finally, virus may settle down in the central nervous system, remain relatively localized, causing a non-paralytic illness, or else spread widely with destruction of nerve cells.

Virus has been isolated from the blood of persons shortly after exposure to infection, during the incubation period, and it is evident that during this phase of viremia, poliomyelitis virus may be susceptible to neutralization by blood antibody. It is on this assumption that the hopes of the current vaccination program are based.

It is now well established that certain factors may influence the dissemination of virus throughout the body. For example, removal of tonsils appears to favor the passage of virus to the medulla. Injuries of various kinds, for example fractures, seem to predispose the injured area to paralysis. Overexertion during the early stages of central nervous system involvement seems to favor the development of paralysis.

Considerable interest has been aroused by reports that the intramuscular injection of antigens during a poliomyelitis outbreak may be followed by paralysis of the inoculation site, within the incubation period of poliomyelitis. There appears to be little doubt that alum-precipitated antigens have this effect. However, in Toronto, we have found no evidence that the current procedure of subcutaneous injection of a fluid diphtheria toxoid combined with pertussis vaccine and tetanus toxoid predisposes to paralysis.

There has been some speculation how traumata and injections predispose to paralysis. It is possible that virus circulating in the blood tends to settle down in damaged muscle, proliferates locally, and then spreads by nerve fibers to the central nervous system. From the recent studies of Bodian in monkeys, however, it seems more likely that these factors act, not locally,

but centrally, by increasing the permeability of blood vessels in the brain and spinal cord to virus circulating in the blood.

Not all age groups are equally susceptible to paralysis. The studies of Melnick and Ledinko showed that in Winston-Salem, N.C., in 1948, the number of paralytic cases per 1000 subclinical infections was 16 in the age group 5–9, but only 6 in the group under 1. That is to say, infection with poliomyelitis virus in the young child is less likely to be associated with paralysis than is infection in the older child.

The Method of Spread of Poliomyelitis

There is general agreement that poliomyelitis is spread by human contact, through the medium of the secretion of the nasopharynx, by stool, by hands, and by intermediate objects. It seems not to be of great practical importance which of the two sources of virus, nasopharynx or stool, plays the greater role, because administratively speaking, poliomyelitis behaves both like a droplet-spread and like a faecal-spread disease.

In Canada, there seems to be little reason to incriminate flies or water in the spread of poliomyelitis, although the situation may be different in the tropics.

For some time, it was customary to teach that patients with poliomyelitis only occasionally contracted their infection from a previous sufferer. This teaching did not take into account the fact that for every one person with paralytic disease, there are many associates with a less severe illness or with no illness, who are yet infected and excreting virus.

Recently, there have been many reports in the literature which have re-emphasized the lessons taught 50 years ago by Wickman and others, that poliomyelitis is indeed a highly infectious and communicable disease. These reports, some of which have been contributed by our group in Toronto, and by other Canadian workers, have referred to the relative frequency with which a history of recent contact with another case or an associate thereof can be obtained.

The family in which there is a case of poliomyelitis is the central point of dissemination, as several laboratory studies have emphasized. Practically all the familial associates of a case are infected and excrete virus, although it is rare for two paralytic illnesses to occur in one family. In fact, multiple paralytic cases occur in less than 10% of infected families. Spread of infection takes place radially from these foci of family infection by human contact. This spread will occur fairly rapidly in urban areas, but much less quickly in rural districts.

Seasonal incidence, such a marked feature of poliomyelitis in North America, is one of the major unsolved problems, and it is unlikely that any single factor will explain this adequately. It is probable that virus survives in the human population between epidemics by means of a chain of mild infections, or perhaps by means of persons who excrete virus for prolonged periods. With the advent of the warmer weather, there is increased mingling of human populations, and increased travel, so that virus becomes more widely disseminated. Probably also there is some increased susceptibility to infection in the host.

Certainly, cold weather *per se* is no barrier to infection, and there have been many winter outbreaks described, some in our own Northwest Territories, Nova Scotia, Quebec, and Alberta.

I have no simple explanation for the varying severity of different epidemics. Western Canada has recently experienced outbreaks with exceptionally high attack rates, yet the strains of virus cannot be differentiated antigenically from those occurring in outbreaks of lesser severity. Recent work of Bodian gives some experimental support to the hypothesis that strains from severe epidemics are mutants which are more invasive than strains from less severe outbreaks. Invasiveness is best defined as a capacity to invade the blood stream, and localize in the central nervous system. Much more work has to be done, however, to prove this postulate.

Possibilities of Control by Isolation and Quarantine

The standard procedures of control of radial spread of virus by isolation of the case and quarantine of contacts have been reviewed by the Expert Committee on Poliomyelitis of the World Health Organization, and more recently by the British Ministry of Health. These authorities urge the adoption of stricter measures of control than have been customary in some areas. Such control measures consist briefly in: (1) reporting all cases of obvious as well as suspect poliomyelitis to the Medical Officer of Health as promptly as possible, preferably by telephone; (2) isolation of the case; (3) quarantine of contacts; (4) community measures to reduce spread of infection.

Ideally, cases should be isolated until virus is no longer excreted, but as this may continue for four or more weeks, some compromise has to be sought. Regulations vary in the length of isolation period recommended, periods of one to three weeks from onset being usual. It would seem desirable to insist on a three week isolation period. Even at this time, about half the patients will probably still be excreting virus in the stool.

The increasing availability of facilities for the recovery of poliomyelitis virus in tissue cultures raises the possibility of isolating patients until stools prove negative for virus. This procedure is unlikely to be practical for some time ahead, except in selected patients and certain centers.

There has been a tendency to recommend hospitalization for all severe cases of poliomyelitis, partly for ease of isolation, and partly because of treatment facilities. Recently, however, it has been recommended by the WHO Expert Committee and others, that home isolation be considered. The family associates are already infected, and by keeping the case at home, their risk is not increased. It has been reported that transportation may increase the severity of the illness, and this seems to apply both to air and road transportation.

If hospitalized, acute poliomyelitis patients must be segregated from other sick persons, perferably in an isolation hospital or a special unit of a children's or general hospital. Strict isolation nursing technique must be employed. Neglect of such precautions may lead to cross infection of other patients, as shown in a number of recent reports which refer to poliomyelitis in a maternity home, an orthopedic hospital, and general hospitals. Of all the

measures designed to prevent cross infections, frequent hand-washing is the most important. Soiled articles are most readily disinfected by heat, since virus is quite quickly destroyed, even at 70°C. Of the various chemical disinfectants, only chlorine-liberating compounds and iodine can be recommended for quick killing of the virus.

In regard to quarantine of contacts, children with intimate exposure to a case should be confined at home for 21 days. There is some difference of opinion in regard to the restrictions to be placed on adults. The British Ministry of Health recommends that the local Medical Officer decide the procedure, on the merits of the case. Agerholm (1953) recommends that quarantine be applied to all those who had contact with the patient as far back as four days before the onset of illness, and this should be applied to household contacts, extra-familial contacts, and contacts at the place of employment. Quarantine means no school, no use of public transportation, no shopping, no theatres or restaurants, and no visiting. These restrictions should be held in force for three weeks.

Schools must play a part in the spread of poliomyelitis, and family and close extra familial contacts should be excluded for 21 days. This regulation should be applied to school teachers who are contacts of a case. In rural areas, where children travel to a central school, it may be desirable to prohibit attendance of students from uninfected localities.

Nursery schools and kindergartens present a problem in control, as virus spreads quickly and widely. Such establishments should be closed if a case occurs, and the children and staff isolated in their homes.

If poliomyelitis occurs in a residential school or camp, the primary case should be removed, but the remainder of the population need not be dispersed; they should be kept under observation for three weeks.

The measures to be taken in a community where poliomyelitis is occurring have been discussed by the WHO Committee. The public should be informed of the need for the highest standards of personal cleanliness, and especially of the necessity for hand washing after defecation and before eating. Unnecessary travel is to be discouraged. School opening may be delayed in the presence of a severe outbreak. Swimming pools should be used only if the water is adequately chlorinated, the residual chlorine being not less than 0.5 p.p.m. at the inlet of the pool.

It would appear that strict application of these principles of quarantine to the first recognizable infections of the season, especially in rural areas, may well serve to abort a threatened epidemic. These methods are certainly worth a trial, especially in rural parts of western Canada.

Prospects of Vaccination in Poliomyelitis

It has been known for many years that monkeys become resistant to challenge with poliomyelitis virus on recovery from infection, or following the injection of chemically treated virus. In fact, work was carried to such a stage 20 years ago that some human trials were actually conducted.

In these earlier experiments, it was difficult to apply strictly quantitative methods, because sufficiently large numbers of monkeys could not be used.

The whole subject of active immunization against poliomyelitis was placed on a much more satisfactory basis by the work of Morgan and her colleagues. In experiments with Lansing virus in vaccinated monkeys, it was established that the degree of resistance to challenge with live virus is dependent on the amount of antibody circulating in the blood.

Work on active immunization of man could not have proceeded much further if Enders, Weller, and Robbins had not found that the virus grows in tissue culture, thus obviating the necessity for making vaccines from monkey spinal cord. As shown by Salk, virus grown in tissue cultures, and treated with formalin till infectivity is lost, still retains antigenicity, and the injection of such material in monkeys and man stimulates the development of antibody.

Remarkable advances have been made in the development in North America of a practical vaccine of this type for trial as a prophylactic. Dr. Jonas E. Salk of Pittsburgh has been the prime mover in the development of this vaccine, with the active support of the National Foundation for Infantile Paralysis, and the assistance of various laboratories and commercial firms in the mass production and processing of virus-infected tissue culture fluids.

We in Canada, may well be proud of the part played in this co-operative venture by the Connaught Medical Research Laboratories of the University of Toronto. The employment of tissue culture Medium 199 of Morgan, Morton, and Parker of the Connaught Laboratories made possible the preparation of a bland vaccine free of horse or other animal serum, and of embryo extracts usually present in tissue culture media. The simple method of producing virus in tissue cultures of monkey kidney in bulk, developed by Farrell and her colleagues in the Connaught Laboratories, made possible the large scale trial of 1954.

Van Riper, of the National Foundation for Infantile Paralysis, gives the following details of the trial carried out in 1954 in 217 selected areas in 44 States, Finland, and three Canadian Provinces. The vaccine was prepared in tissue cultures of monkey kidney, and treated with formalin to destroy virus. It contained the three antigenic types of virus.

1. Between April and July, 625,000 children aged 6 to 8 received three injections. Of these, 425,000 received Salk vaccine and 200,000 Mixture 199 alone. About 1,200,000 children participated as observed controls.

2. In some control areas, about half the children in Grades 1, 2, and 3 received vaccine, and half received medium only (placebo).

3. In other control areas, Grade 2 children received vaccine, the children in Grades 1 and 3 serving as observed controls.

4. Three shots of 1 c.c. of vaccine were given in the left triceps. The second was given one week after the first, and the third, four to five weeks later.

5. The vaccine proved to be safe, and untoward reactions were minimal.

The evaluation of the vaccine used in this trial has just been completed by Dr. T. Francis, Jr., of Ann Arbor, Michigan, and he has announced that the incidence of poliomyelitis in inoculated persons has been substantially reduced. Particularly significant is the reduction of incidence when laboratory criteria are used for diagnosis.

The objective of vaccination is to stimulate circulating antibody which will

neutralize virus reaching the blood following initial multiplication in the gastro-intestinal tract. It is hoped that this antibody will prevent viremia, and therefore central nervous system invasion. It is not known if intestinal carriage will be affected by the presence of circulating antibody.

Salk has shown that when formol-treated vaccine is injected in those who have some initial antibody, the level rises promptly to a very high titre. In persons with no initial antibody, the titres developed are much lower. Recently, Salk has suggested that the primary course of immunization consists of two injections at intervals of two to four weeks. This serves to sensitize the antibody producing mechanism so that when the third or booster shot is given not less than seven months later, there is a rapid increase in antibody.

Progress made with the Salk-type vaccine, which contains inactivated virus, should not obscure the long term objective, which is the development of the simplest, cheapest, and most effective vaccine possible. Research is also actively in progress on the development of a live non-virulent variant, somewhat analogous to the well-known 17 D strain of yellow fever. The idea behind this approach is that such a virus would be given once, by mouth, would proliferate in the intestinal tract, and stimulate a more permanent immunity resembling that following natural infection.

Attempts at producing virus variants of each antigenic type that have lost original virulence are being made by various methods. Some progress has been made in the development of suitable variants in fertile eggs by Cox and his associates, in rodents by Koprowski, and in tissue cultures by Sabin. It is to be hoped that research in this field will be continued, as it seems to be one of considerable promise.

The Role of Gamma Globulin

Experimental work has shown that protection against poliomyelitis can be conferred on mice and on monkeys by the inoculation of preparations containing poliomyelitis antibody. The most convenient source of antibody for such tests is gamma globulin prepared from the pooled blood of adult donors. Gamma globulin prepared from Canadian blood in the Connaught Medical Research Laboratories is known to contain high levels of antibody for all three types of virus. This is because of the widespread occurrence of subclinical infection, which leads to the development of serum antibody

In the well-known trial carried out in the United States of America by Hammon in 1951 and 1952, gamma globulin was administered to children in three areas where epidemic poliomyelitis was occurring. The injections were designed to give blanket protection to those in the susceptible age groups.

The latest evaluation of the results, based on laboratory-confirmed cases, showed that the product conferred definite protection from two to five weeks after the inoculation. There was no protection during the week following the injection.

Gamma globulin has been used quite extensively in Canada and the United States since the original trial, but mainly in family contacts of cases. Supplies have seldom been adequate to use for blanket protection of all children in a stricken community, although this may well represent the method of choice.

Gamma globulin is of little practical value as a means of preventing poliomyelitis in familial and close associates. This is not surprising, when one considers that the majority of family associates are infected at the same time, although less than 10% develop paralysis. Of the secondary cases that do develop, 60% occur by the fifth day after the onset of the primary case; clearly, gamma globulin cannot prevent such infections, as the virus must be well established at the time of inoculation. Of the remaining 40% of secondary cases, perhaps about half occur during the period when gamma globulin may be expected to protect. Although this group is small, the chances of contracting poliomyelitis may be greater than in the community at large. It must be realized that the administration of hundreds of shots is needed to prevent one paralytic case.

Gamma globulin is now usually reserved for certain groups at special risk: pregnant women, children who have to be tonsillectomized during an outbreak, and children exposed in nursery schools, hospital wards, residential schools, and camps. If supplies are adequate, use can be recommended for blanket protection in small communities where a severe outbreak is in progress.

Although the practical value of gamma globulin in the control of polio is not great, the experiment of Hammon and subsequent studies of Brown and his associates have yielded information of considerable value in the general field of immunity in poliomyelitis. In particular, it appears that relatively low levels of serum antibody will protect against paralytic polio, and that even in persons inoculated with gamma globulin, intestinal proliferation of virus may still occur. These findings are of obvious applicability to the vaccine programme.

Summary

1. This paper reviews advances in those aspects of poliomyelitis that concern the practising health officer.

2. Advances in tissue culture methods are described, and their fundamental importance is discussed.

3. Examples of the application of tissue culture methods to the laboratory diagnosis of poliomyelitis are given. By the prompt identification of poliomyelitis virus in pathologic specimens, the virologist can often assist the clinician in diagnosis.

4. Among the application of tissue culture methods is use for the typing of strains. A map portrays the geographic distribution of 117 Canadian strains isolated in almost every part of the country from 1948 to 1954. No less than 108 of these strains belonged to Type 1.

5. Newer proposals for the control of poliomyelitis by longer isolation of the case and more strict quarantine of contacts are outlined, with main references to proposals of the World Health Organization Expert Committee on Poliomyelitis.

6. Current progress in the development of the Salk-type formolized tissue culture poliomyelitis vaccine is discussed, and reference made to certain studies in the Connaught Medical Research Laboratories that facilitated the inauguration of the successful large scale trials in North America in 1954.

7. The present role of gamma globulin is briefly discussed.

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Commercial Health Insurance in Canada

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THE Canadian Life Insurance Officers Association is a trade association of the life insurance companies which have in force some 99% of the $21 billion of life insurance protection enjoyed by the Canadian people. Our members are very much interested in the subject of health insurance because many of them are actively engaged in the sale of insurance offering reimbursement against hospital, medical and surgical expenses. I should like to make it clear, however, that any opinions I may express are my own and do not necessarily reflect the views of the companies I represent.

The provision of insurance against the cost of health services is an exceedingly complex undertaking and there are widely varying social philosophies as to the form such insurance should take. Should it be administered by government on a compulsory basis or should it be conducted on a voluntary basis through the private agencies in our free enterprise system? Or, again, should health services be financed out of general taxation and be made available to all, as required, without specific charge? You will not be surprised when I tell you that I am an advocate of the voluntary method but will, I am sure, be equally relieved to learn that it is not my intention at this time to provoke a debate on these very contentious and difficult questions.

Forms of Commercial Health Insurance Policies

The forms of health insurance policies issued by insurance companies may from the underwriting point of view be divided into two broad classes, namely, group contracts and individual contracts. The life insurance companies in Canada are most active in the group field and I am accordingly most familiar with this particular phase of the business. Hence, while not restricting my remarks entirely to group insurance, I shall deal with it in somewhat more detail than individual insurance.

Group Contracts

Group cover is provided through a "master" policy and insures a group of persons who are affiliated in some way other than for the sole purpose of obtaining the insurance. While such contracts may be made with trade or professional associations or with labour unions, the vast majority are issued to an employer to protect his employees. The insurance of each individual in a

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group continues in effect so long as he remains a member of the group and so long as the master policy remains in force.

It is not so many years ago that groups were required to consist of not fewer than 25 lives to qualify for this type of cover but many insurance companies will now go down to employer-employee groups of as few as 10 lives and some will consider even smaller groups. Further, the practice of insuring trade association groups has enabled thousands of very small employers to obtain this form of protection for themselves and the members of their staffs.

The lives to be insured under a group policy are not required to submit to a medical examination or present evidence that they are in good health. The mere fact that they are actively at work, combined with the exercise of prudent underwriting procedures, is relied upon to produce an average experience taking the group as a whole. For example, individual members of the group are not permitted to select the amount for which each will be insured, the level of the benefits being fixed by formula. Again, it is customary to require a minimum percentage (customarily 75%) of the eligible employees to participate in the plan where such employees contribute toward the cost of the insurance; and where the employer is paying the full cost, it is generally required that all eligible employees be covered. These are illustrations of the underwriting techniques used to avoid "anti-selection", i.e., to prevent the less healthy lives from choosing disproportionately large amounts of insurance, and to guard against the poor risks electing to be insured and the better risks electing to remain uninsured.

A variety of forms of group cover are written. The most common are so-called weekly indemnity benefits which compensate the insured life for loss of time from work due to accident or illness, and insurance against the cost of hospitalization, surgical treatment and medical care other than surgery. The last three types of cover may also be extended to cover the dependents of an insured employee, namely, his wife and dependent unmarried children; dependent children are frequently defined as those between the ages of 14 days and 19 years.

The premiums charged for group insurance cover are naturally higher in cases where the employee's dependents are protected against hospital, surgical and medical expenses. However, no attempt is made to obtain exact information as to the number of each employee's dependents and to vary the premium depending upon the size of each individual's family.

As has been mentioned earlier, it is common practice for the employer to bear part or all of the cost of the group insurance benefits provided for his employees. In fact, employee-pay-all plans are frowned upon from an underwriting point of view and are discouraged. No precise information is available as to the proportion of the cost of group accident and sickness contracts that is, on the average, borne by the employer. The informed opinion of several actuaries responsible for their companies' operations in this field indicates that the average employer's share would be from 35% to 45% of the total cost.

The cover granted under group contracts is usually non-occupational in

form so as to avoid duplication with workmen's compensation insurance. Otherwise, it is almost wholly free from exceptions and exclusions.

Individual Contracts

The benefits granted under individual policies are broadly similar to those available on a group basis. However, this type of policy does offer a degree of flexibility not available under any method of mass cover. The level of benefits may more readily be varied to meet the individual requirements of the purchaser and such policies are not infrequently sold to supplement the formula-type of benefit available under group contracts.

In the case of business issued on an individual basis, a policy is prepared for each insured person. Further, the insured deals directly with the insurance company in the payment of premiums and in other transactions concerning his insurance. Since the merchandising of individual policies is conducted on a retail basis, their cost is naturally higher than in the wholesale business of group insurance.

One important type of individual contract is the family policy which protects not only the insured but also his wife and children. The majority of individual policies provide protection on a year-to-year basis and must be renewed annually subject to the willingness of the insured to continue paying premiums and of the insurer to continue the insurance. Non-cancellable policies are also available provided the purchaser is prepared to pay a somewhat higher premium. They are quite similar to the more common type of contract except for a guarantee by the company that they will be renewed up to a specified age or termination date, subject only to the continued payment of premiums by the insured.

Principal Forms of Commercial Health Insurance

I shall next endeavour to describe briefly the principal types of benefit offered under group accident and sickness policies.

Group Weekly Indemnity Benefits

This type of cover is designed to reimburse an insured employee for loss of working time due to disability as a result of accident or sickness. Benefits are paid in cash and usually commence after a short waiting period and continue during disability up to a stipulated maximum period. Waiting periods of either three or seven days are most common, and when disability is due to an accident there is frequently no waiting period at all. In the case of disabilities due to pregnancy, it is customary to limit the duration of benefits to six weeks.

A typical policy might provide the average wage-earner with benefits of $25 weekly for a maximum period of 13 weeks, while a more liberal policy might pay as high as $35 weekly for as long as 52 weeks.

Group Hospital Expense Insurance

Group hospitalization policies provide benefits in respect of the hospital's daily charges for room and board and for special services necessary for the

care and treatment of the patient. Such benefits are ordinarily granted on a reimbursement basis and are not therefore permitted to exceed the actual charges made by the hospital.

The daily benefit for room and board is expressed as "up to" a specified number of dollars for each day of confinement and continues to be payable for a stipulated number of days during each period of disability. It may be noted that benefits are not limited to any fixed number of days in the year and that two or more claims for the maximum duration are possible if the separate periods of hospitalization are due to unrelated causes and recovery from one disability occurred before the commencement of the next. On the other hand, two or more periods of hospitalization for the same or a related cause are treated as a continuous period of disability unless there was a minimum period of complete recovery between confinements. It is not unusual to require that the patient be confined to hospital for a minimum period of 18 hours to qualify for benefits although this restriction does not apply where he is receiving emergency care following an accidental injury or is undergoing a surgical operation.

The maximum reimbursement for special hospital services is usually expressed as a multiple of the daily allowance for room and board. The types of service for which benefits will be paid are subject to little restriction but do not include the cost of special nurses or physicians' fees. Other items of expense like telephone calls and visitors' meals, which are not necessary for the treatment of the patient, are likewise excluded.

Obstetrical benefits for both female employees and dependents may be provided. However, when maternity is covered, the maximum benefit (for room and board and special hospital services taken in combination) is customarily limited to ten times the daily rate of reimbursement.

A typical group hospitalization policy might provide up to $7 or $8 daily for a period of 31 days and up to ten times the daily rate of benefit for special hospital services. A generous policy providing maximum benefits might provide as high as $10 to $15 daily for a period of 180 days with 20 times the daily benefit for special services.

Group Surgical Expense Insurance

Group surgical expense policies are designed to provide reimbursement for surgeon's charges and provide a stipulated maximum benefit for each type of operation, as set forth in a schedule contained in the policy. This form of cover is usually required to be written as a supplement to a group policy granting weekly indemnity or hospitalization benefits. A variety of surgical fee schedules can be purchased depending upon the maximum benefit allowed for the most difficult types of operation. The schedules most commonly in use at the present time have maxima of $200, $275 and $300. Illustrations of the benefits payable under a $300 schedule are as follows: tonsillectomy (adults), $35; appendectomy, $100; normal childbirth, $60; removal of kidney, $150; and gastrectomy (total), $300.

Group Medical Expense Insurance

Group medical expense insurance is designed to pay doctors' bills other than those covered by surgical expense insurance. There are several forms

of this benefit from which the prospective purchaser may make his selection. The so-called comprehensive contract provides reimbursement for the cost of medical care, whether or not the insured is disabled and unable to work. A second form, called the "in-hospital" plan, pays benefits for doctors' visits only while the patient is confined to a hospital for treatment other than surgery. The third type of contract is generally called the total disability plan and provides that benefits will only be paid during a period of disability rendering the patient unable to work.

Dependents may be covered under either of the first two plans but not under the total disability plan because of the practical difficulty of defining or establishing total disability in the case of housewives and children.

The benefits payable under each of the three plans are usually subject to some overall limit in respect of any one period of disability; such limits are customarily set at a level of $150 or $200 but in particular cases may run to a higher figure. It is also quite common to exclude the first two or three calls before benefits commence on the comprehensive and total disability plan. A typical scale of benefits would be $2 for an office visit and $3 for a home or hospital visit although in the case of a liberal plan these figures might be $3 and $5, respectively.

Major Medical Expense Insurance

I should now like to take a few minutes to describe in slightly greater detail one of the most recent forms of cover in the field of accident and sickness insurance. For some time now there has been a growing feeling on the part of some of the experts that insurance companies started out on the wrong foot in providing reimbursement for the many minor items of medical expense that arise so frequently in day-to-day practice. For example, when a claimant receives a cheque for $9 on account of three visits to his home by his family physician, or a surgical fee of $5 for the incision and drainage of a superficial abscess, the chances are that the overhead cost of processing such a claim exceeds the amount of the claim itself. Even more importantly, the payment of such a relatively small sum cannot possibly have any material effect on the budget of the normal family.

This line of thinking has led numerous people to the conviction that the really important function of insurance is not to grant compensation for a multitude of minor items of expense but to assist in minimizing the financial burden of the truly disastrous, but less common, misfortunes. Hence, a form of cover called major medical expense insurance has been developed in the last few years. It is still in what might be called the experimental stages but a variety of contracts, differing considerably on points of detail, have been offered in the United States on both a group and individual basis. This movement has now spread to Canada and protection of this kind is currently being made available by a number of the insurance companies.

As already stated, major medical expense insurance is specifically designed to lessen the financial shock of crippling hospital and medical expenses. It takes a leaf out of the book of automobile collision insurance by introducing the deductible principle and providing that benefits commence only after the

insured has incurred hospital and medical costs exceeding a stipulated sum. In addition, the insured is required to co-insure the risk by sharing in the cost of services over and above the amount of the deductible.

Probably the simplest way of indicating the essential features of this plan is to describe briefly an actual major medical expense policy recently written on a group basis. In this instance, the benefits were issued to supplement group hospital and surgical insurance of the orthodox type providing hospital benefits of $9 per day for 70 days and surgical benefits based on a $300 schedule. The new contract issued to supplement the basic insurance protects both employees and their dependents, and provides cover for the following expenses, whether treatment is received at home, in the doctor's office, or in the hospital:

(1) physicians' and surgeons' fees, including specialists; (2) hospital room and board up to $7 per day in excess of basic benefits; (3) charges for other hospital services; (4) registered graduate nurses; (5) drugs and medicines; (6) x-ray and diagnostic services; (7) x-ray and radium treatments; and (8) anaesthesia, administration of oxygen, blood transfusions, and local ambulance service. All of these services must be recommended by a physician or surgeon.

The policy also provides that certain other medical expenses are not covered, including the following: (1) periodic health check-ups or travel for health, dental services, normal eye or ear examinations, or cosmetic surgery; (2) injury or sickness covered under Workmen's Compensation; (3) any services for which payment is not required; and (4) expenses resulting from an act of war.

Benefits under the plan are determined by deducting from the total medical expenses of the employee and of his dependents during a benefit year—(1) claim payments under the basic group hospital and surgical policy; and (2) 3% of the annual earnings of the insured employee, or $100, whichever is the greater. The major medical expense policy pays 75% of the remaining medical expenses with the maximum amount payable to the employee in any one benefit year being $5,000, and the maximum amount payable for all injuries and sickness of any one individual at any time also being $5,000. A benefit year is defined as any 12-month period starting from the date of the first medical expenses included in the claim. Once a benefit year expires the deductible feature again applies before the payment of further benefits begins.

There are many people who hold out high hopes for the future of major medical expense insurance and who believe that it will fill one of the obvious gaps in the more limited form of cover that has been sold so extensively during recent years. Admittedly, its widespread acceptance will call for a changed point of view on the part of the public, the present disposition being to attach some importance to the need for reimbursement of relatively small hospital and medical expenses starting with the first dollar. Increased emphasis will have to be placed on the greater importance of protecting the family against the crushing costs that can arise in the less likely event of a really serious and protracted disability. It is much too early to forecast how popular major medical expense insurance may eventually become but it is encouraging to find that it is being purchased in increasing volume in the United States.

Number of Canadians Enjoying Voluntary Protection

Many of you will have seen copies of a booklet entitled "Financing Health Services in Canada" which was published this year by the Joint Committee on Health Insurance, a body organized in 1953 by the All Canada Insurance Federation and The Canadian Life Insurance Officers Association. Its purpose is to show the rapid strides that have been made in the last ten years in making voluntary forms of health insurance available to Canadians. The booklet also includes a brief description of the basic health services provided by government.

The statistics for this booklet were obtained from the Blue Cross Plans, from medical care plans sponsored by the medical profession, from the co-operative plans (mainly in Ontario), and from both the life and casualty insurance companies. The aggregate figures compiled from these comprehensive surveys, after making a deduction for estimated duplication of lives, show that nearly 5½ million Canadians had some form of voluntary hospital expense insurance at the end of 1952; that about 4 million enjoyed surgical expense protection; and that approximately 3 million were insured under medical expense policies. One of the most striking features of these figures is that most of these people have acquired their insurance during the last 10 years. In fact, the remarkable growth of voluntary hospital insurance is indicated by the fact that the number of people without insurance has been reduced by nearly 5,000,000 during the space of a single decade. With particular reference to the activities of insurance companies, it is of interest to note that their premium income from all forms of accident insurance and sickness insurance more than doubled between 1932 and 1942 and increased sevenfold from 1942 to 1952.

It is also relevant to mention that the number of lives covered under voluntary plans of health insurance is continuing to increase rapidly. For instance, the ratios of increase during 1952 were 7.6% for hospital cover, 20.0% for surgical cover, and 31.9% for medical cover. It will be noted particularly that surgical and medical insurance, the more recently developed forms of cover, are currently expanding at a more rapid rate than hospital insurance.

Co-insurance

Before bringing this paper to a close, I should like to make a few comments on two particular, and sometimes misunderstood, characteristics of the contracts of insurance companies, and to refer briefly to one major problem that confronts all of the voluntary plans.

Firstly, it is well known that most insurance company contracts do not attempt to reimburse the insured for the full amount of his bill. In other words, these contracts involve a co-insurance feature which simply means that the policyholder shares with the insurance company the cost of the charges incurred.

I am sure that the reason for adhering to the principle of co-insurance will be obvious to all of you. Its purpose is simply to impose a check on over-utilization by requiring the patient to retain some financial interest in

the charges which he incurs. The fundamental soundness of the co-insurance principle has been amply demonstrated during many decades of experience in numerous other lines of insurance and there seems to be no reason for believing that it won't also prove effective in the field of hospital, surgical, and medical insurance.

In an era when increasing numbers of hospital beds are becoming available and when there is no longer any deep-seated public fear of being hospitalized, the threat of significant over-utilization is by no means an academic question. In at least some situations, the patient can have considerable influence not only on whether he is treated in the hospital or at home but, if hospitalized, also on the volume of special services he receives and the duration of his confinement. While co-insurance is probably not a complete answer to this problem, the insurance companies are genuinely convinced that the imposition of some financial restraint on the patient encourages him to exercise a measure of responsibility in the services he demands.

The Non-Profit Concept

I should also like to offer a few observations on the stigma frequently attached to the insurance business because it operates on a so-called "profit" basis.

There are people who say that no one should make a profit out of human misery and yet it is difficult to understand why insurance should be singled out for this criticism. The doctor makes a profit on his practice or he wouldn't be in business; and his office nurse does or she wouldn't work for the doctor. And is it ever suggested that the manufacturers of x-ray equipment or hospital beds or pharmaceuticals are not entitled to a fair return on the goods they produce? Frankly, it is something of a mystery to me how the advocates of this view are able to preserve consistency in the stand they take. Further, I am not prepared to concede in a private enterprise economy like ours that there is anything immoral about making a reasonable profit in return for rendering a valuable service.

It may also be salutary to remind ourselves that our private enterprise system is actually a profit *and* loss system. This comment is especially pertinent in the case of hospitalization insurance where it seems to be a constant struggle to maintain a reasonable balance between premium income and claims outgo. For example, in 1952 thirty-six companies issuing group hospitalization contracts paid out in claims 91.8% of the $17 to $18 million they received in premiums. Having in mind that the balance left after paying claimants had to take care of all administrative expenses, including the 2% tax on premiums in respect of which the insurance companies enjoy a "monopoly", it will be obvious that this class of business is not the gold mine it seems to be in the minds of some people.

I should also like to mention that many insurance companies, indeed several of the very large ones, are purely mutual. They have no shareholders, pay no corporate dividends and are completely free of any proprietary interest. They do in fact operate on a truly non-profit basis but it is significant that the companies with capital stock are able through efficient administration

to compete effectively with these mutual companies and to write their fair share of the business. One is thus driven to the conclusion that the importance of the non-profit concept is greatly exaggerated and that a company's success is dictated in larger measure by its ability to offer quality service at competitive prices.

Co-operation of Patients, Doctors, Hospitals and Insurers

One of the major problems facing not only insurance companies but all voluntary agencies in the health insurance field concerns the abuses that sometimes arise in the presentation of claims. The correction of such abuses is not a simple matter due in no small measure to the complex human relationships involved in a transaction affecting the patient, the doctor, the hospital and the insurer. However, it is of the utmost importance that abuses be reduced to a minimum if the cost of voluntary insurance is not to increase beyond the reach of the average Canadian.

What are some of these abuses to which I have reference? One thinks of the patient who demands that he be hospitalized for some trivial ailment that does not require hospitalization at all. Or of the patient who presses for an extension of hospital confinement for the sole purpose of being discharged at a time better suiting his personal convenience. Again, the case arises where a surgeon feels that the existence of insurance increases his patient's ability to pay and he thus upgrades his fee beyond what it would normally have been.

Situations of the character indicated, including the more glaring case of the dependent who was first hospitalized for a hysterectomy and some time later for a confinement, come to light from time to time. However, one of the principal concerns arises out of one's wonderment as to the number of such cases that go undetected for every one that is discovered.

I should like to make it abundantly clear at this point that these remarks are not to be construed as any blanket charge concerning the honesty of our policyholders, the hospitals or the members of the medical profession. Any such implication would be far from the truth because these various classes of people are on the whole perfectly reputable citizens.

It has always seemed to me that many of the abuses that come to our notice are due to a misunderstanding of basic insurance principles and a failure to comprehend what insurance can or cannot do. We have all heard the remark that "the insurance companies have lots of money" and that a few dollars one way or the other in a claim payment is a matter of trivial concern. But do the people who make these remarks stop to realize that the funds of the company are made up of their own premium payments and those of their fellow policyholders? Any policyholder who receives more than he is properly entitled to does so at the expense of the general body of policyholders. Further, if the aggregate of all claims exceeds the company's income from premiums and other sources over a period of time, there can be only one result, namely, an increase in premium charges.

My reason for mentioning this phase of the insurance process is to plead for a greater degree of co-operation and understanding among the various

interests involved in the distribution and administration of voluntary health insurance. These abuses constitute our Achille's heel and, left unchecked, could eventually lead to the failure of the voluntary approach. It is important to note, too, that such abuses are not confined to voluntary health insurance plans but are also characteristic of compulsory plans operated by government. Possibly the main difference is that governments are in a preferred position to police the situation by subjecting hospitals and the medical profession, in particular, to a maze of rules, regulations, directives and reporting requirements designed to minimize abuses of the kind under discussion.

Conclusion

In concluding these remarks, I should like to repeat that most of the developments in the field of voluntary health insurance have taken place during the short span of the last ten years. The business is a most dynamic one and many changes have already taken place during this period. Some have been brought about by altering conditions and others by the added knowledge acquired through experience. New methods, new types of cover, changes in benefit levels—all of these things indicate that the business is far from static and that future experimentation will undoubtedly produce solutions to some of the problems that now seem so baffling.

There are many of us in the insurance business who feel that voluntary forms of protection combined with basic government services have already gone a long distance in helping Canadians to solve the problem of financing their health costs. Doubtless, further progress will be made as both the private agencies and governments expand the services they offer in their respective fields. There are still many challenging difficulties to be tackled but it is a fact that each year sees a significant reduction in the number of Canadians for whom health costs are a serious problem.

Studies on Staphylococcal Beta-Toxin

J. M. B. CORKILL, B.A., Ph.D.,
Connaught Medical Research Laboratories
University of Toronto

THE haemolysins of staphylococcus pyogenes may be broadly classified as alpha or beta-toxin on the basis of their haemolytic characteristics. The importance of the alpha-toxin-producing strains in human infection has been recognized, while beta-toxin-producing strains have commonly been recovered from animals. Lack and Wailing, in 1954, (1) reported that 14.5% of 435 strains of human origin produced beta-toxin. The rapid lethal action of alpha-toxin on laboratory animals is well known and the pharmacological action of this toxin has been described by Kellaway, Burnet and Williams (2).

A strain of staphylococcus which produces beta- and no alpha-toxin was obtained from Dr. C. E. Dolman. The beta-toxin prepared from this strain was toxic for rabbits. The time of death of the animal could be delayed by the use of small doses of the toxin. When these animals were autopsied a gross examination showed that changes had taken place in many of the organ systems (3). Experiments were carried out to determine whether any biochemical test would show the malfunctioning of the affected organ systems. An outbreak of boils often occurs about the time a patient may be found to be suffering from diabetes. Gilchrist and Wilson in 1934 (4) thought that staphylococcal infection was an important aetiological agent in diabetes. This would suggest that changes in the blood sugar levels of animals injected with toxin might show the effect of the toxin on the animal's ability to metabolize sugar. This paper presents the observations made in these Laboratories on the hyperglycaemia produced in rabbits by the injection of small amounts of beta-toxin and the part which active immunization or treatment with antitoxin and insulin play in modifying this effect of the toxin.

Methods

Toxin was produced in a modification of Macmorine's (5) liquid medium, and contained 4% Difco purified casamino acids. One litre of medium was placed in a 5-litre Povitsky bottle, seeded, and the atmosphere in each bottle was adjusted to 35% carbon dioxide and 65% oxygen. The bottles were placed on rocking machines and incubated at 37°C for approximately 40 hours. Pooled toxin from uncontaminated bottles was recovered and sterilized by Seitz filtration. In freshly harvested toxin, 0.0002 ml of toxin may haemolyse 0.05 ml of a 10% suspension of sheep red blood cells using the hot-cold technique. The haemolytic titre of the toxin used in these experiments was 0.0008 ml. The rabbits were normal animals and not of any particular breed. The serum of the animals used in these tests contained no titratable antitoxin. All the rabbits were shown to have a normal sugar tolerance curve. In carrying out the normal sugar tolerance test, the animals were starved for 60 hours

and a sample of blood was drawn from the marginal ear vein for determination of the normal sugar level. The animals were injected intravenously with 20 ml of a 25% sterile solution of dextrose. Blood samples were taken hourly and the blood sugar determined by the Folin-Wu method.

The Effect of Beta-toxin on the Blood Sugar Level

To determine the effect of the toxin on the blood sugar level the amount of toxin to be injected was made up to a final volume of 5.0 ml with sterile normal saline and injected intraperitoneally. The results of the tests are given in Table 1. The control rabbits receiving no toxin and the rabbits injected with

TABLE 1

EFFECT OF BETA-TOXIN ON BLOOD-SUGAR LEVEL

Volume of Toxin Injected	Blood Sugar in Mg Percent							Death in Hours After Toxin Injection
	Normal Level	Hours After Injection of Toxin						
		1	2	3	4	5	6	
0	105	125	120	115	110	115		
0	120	145	145	142	147	153	147	
0.1 ml	125	165	128	138	128	140	138	Survived
0.2 ml	113	193	205	243	238	255		Survived
0.2 ml	138	148	305	255	268	385	380	Survived
0.2 ml	95	193	395	325	448	438	440	Survived
0.2 ml	145	330	360	400	360	440	350	Died in 6.5 hrs.
0.4 ml	112	240	340	No Samples				Died in 4.5 hrs.

0.1 ml of toxin show little variation in the blood sugar level throughout the test. Rabbits receiving 0.2 ml of toxin show a rapid increase in blood sugar levels which are maintained for some hours after the injection. There is considerable variation in the response of individual rabbits. The dose producing this effect is not necessarily lethal. Larger doses produce a pronounced early response but the animal becomes so ill that blood samples are difficult to obtain and early death takes place. Some of the blood samples were divided into two portions. One showed a large amount of reducing substances in the blood when tested by the Folin-Wu method. The other part of the sample was digested with fresh growing yeast after the method of Dr. T. F. Nicholson (6) following which there was little or no reducing substance left in the blood when tested. This demonstrated that it was sugar.

Rabbits injected with doses of toxoid, which were as much as five times the largest dose of toxin administered, did not show an increased blood sugar level (Table 2). Therefore, the hyperglycaemia is due to the action of a product of staphylococcal growth which may be detoxified by formaldehyde and heat at 37°C and not to a constituent of the broth, in which the organisms were grown.

The Specificity of the Effect of Beta-toxin

Rabbits were immunized with several series of intravenous injections of beta-toxoid. Trial bleeds of the rabbits were taken and after heating the serum

TABLE 2

EFFECT OF TOXOID COMPARED WITH TOXIN

Volume Injected	Blood Sugar in Mg Percent					Death in Hours After Injection
	Normal Level	Hours after Injection				
		1	2	3	4	
Toxoid						
0.30 ml	138	148	138	130	145	Survived
1.5 ml	118	118	112	138	180	Survived
Toxin						
0.28 ml	115	288	438	428	335	Survived
0.30 ml	105	118	138		238	Died in 4.5 hrs.

at 56°C for 30 minutes the ability of the serum to neutralize the haemolysin of the toxin was tested. The serum of the four immunized rabbits varied in potency from one in which 1.0 ml of the serum neutralized 1875 minimal haemolytic doses of the toxin to another which neutralized 10,000 doses per ml. Later these sera were calculated to contain approximately 2.0–10.0 units of beta-antitoxin per ml.

When these actively immunized rabbits were injected with toxin there was no increase in the blood sugar levels and they did not die from the effects of the toxin. Normal control rabbits injected with the same doses of toxin showed marked hyperglycaemia and died (Table 3). Thus, it is shown that this

TABLE 3

PROTECTIVE ACTION OF ACTIVE IMMUNIZATION

Rabbits	Volume of Toxin Injected	Blood Sugar in Mg Percent						Death in Hours After Toxin Injection
		Normal Level	Hours After Toxin Injection					
			1	2	3	4	5	
Normal								
1	0.2 ml	110	193	204	243	235	260	Dead <24 hrs.
2	0.4 ml	105	142	183	272	No Samples		Dead < 8 hrs.
Control	0	110	113	120	120	120	115	
Immunized								
1	0.2 ml	110	115	130	122	127	130	
2	0.4 ml	115	95	115	112	112	103	
	0	105	103	102	106	107	107	

action of the toxin is specific and that active immunization protects animals from death and the hyperglycaemia-producing effect of the toxin.

Comparison of the Effect Obtained with Intramuscular and Intraperitoneal Injection

The rapid change in the animals' blood sugar levels described follows an intraperitoneal injection of an adequate amount of toxin. The minimal doses of toxin which produce this effect when injected intraperitoneally may have

little or no effect when administered intramuscularly in the forelimb of the rabbit (Table 4). Even with larger doses the response is delayed for at least two hours after the injection and the blood sugar levels reached are low compared with the levels reached following the minimal doses administered intraperitoneally. It is noted that the animals injected intramuscularly survived larger doses of toxin than animals receiving the toxin intraperitoneally.

TABLE 4

COMPARISON OF INTRAPERITONEAL AND INTRAMUSCULAR INJECTION

Volume of Toxin Injected per Kilo Body Wt.	Blood Sugar in Mg Percent					Death in Hours After Toxin Injection
	Normal Level	Hours After Toxin Injection				
		1	2	3	4	
Intraperitoneal						
0.1 ml	123	205	213	248	270	Survived
0.12	150	210	374	240	205	Dead <24 hrs.
0.14	165	190	248	350		Dead <6.5 hrs.
Intramuscular						
0.1 ml	132	136	140		182	Survived
0.12	122	126	149	142	150	Survived
0.14	125	130	130	210	149	Survived
0.16	125	163	155	200	182	Dead <24 hrs.
0.18	148	142	165	200	205	Dead <6.5 hrs.

The Effect of Antitoxin

It has been shown in Table 3 that animals which have been actively immunized with toxoid are protected from the lethal and hyperglycaemic action of the toxin. In Table 5 are recorded the results obtained when antitoxin is injected intramuscularly for treatment, and prophylactically to protect animals injected with toxin. The antitoxin used was a routine purified lot of antitoxin of equine origin, modified by peptic digestion, containing antibodies for alpha- and beta-toxins. The potency of the beta-antibodies in the antitoxin was equal to 60 international units per millilitre. The test animals received 5.0 ml or 300 units of the antitoxin intramuscularly. It was determined that the lethal dose of the toxin was an injection, intraperitoneally, of 0.12 ml per kilo. 0.08 ml of toxin was neutralized by 1 unit of antitoxin. The animals were given 0.14 ml per kilo; on the average they received a total dose of 0.44 ml of toxin which represents an amount neutralized by 5.5 units of antitoxin. The rabbits actually received a total injection of 300 units of antitoxin. Experimentally the antitoxin was injected 30 minutes before the toxin, at the same time as the toxin, and 2 hours after the toxin. Usually the blood sugar level reaches its highest value two hours after receiving the toxin and then levels off at this high value. The results of these experiments, as compared with one in which a rabbit received no antitoxin, are shown in Table 5. As pointed out earlier, an actively immunized rabbit whose serum possesses approximately 2–10 units of beta-antitoxin per ml is protected from any effect the toxin may have on the blood-sugar level. When passively protected with antitoxin administered intramuscularly before the toxin, there is a slow gradual rise

TABLE 5

THE EFFECT OF ANTITOXIN

5.0 ml Antitoxin Injected Intramuscularly	Vol. Toxin 0.14 ml per Kilo	Blood Sugar in Mg Percent						Death in Hours After Toxin Injection
		Normal Value	Hours After Toxin Injection					
			1	2	3	4	5	
30 minutes before Toxin	0.43 ml	130	175	195	200	237	255	Survived
Same Time as Toxin	0.455 ml	145	310	425	395	380	290	Survived
2 hrs. after Toxin	0.44 ml	123	273	345	345	365	410	<24 hours
Actively Immunized Rabbit	0.4 ml	115	95	115	113	113	103	Survived
Control—0.12 ml/Kilo of Toxin	0.36	105	145	205	255	—	—	<5 hours

in the blood-sugar level and the rabbit survives. When given at the same time as the toxin, the blood-sugar rises very quickly to a high level two hours after receiving the toxin. Following this the blood-sugar slowly falls until at five hours it is midway back to normal and the rabbit survives. When the antitoxin is given two hours after the toxin the blood-sugar level has already nearly reached its peak. After receiving this dosage of antitoxin the blood-sugar levels off for one hour and then climbs slowly to the peak, observed in the last sample taken 5 hours after the toxin injection. The animal was not sufficiently protected and died in less than 24 hours. This experiment shows that immunization, or antitoxin administered prophylatically will enable the animal to survive. This antitoxin in the dosage administered is not effective in treatment when the rapidly-acting toxin has already combined with the susceptible animal tissues.

The Effect of Insulin in Protecting the Animal from the Effects of Toxin in the Blood-Sugar Level

Having established that injection of beta-toxin has the effect of raising the blood sugar level of rabbits we wondered what effect insulin would have in controlling this hyperglycaemia. The experiment was carried out in two parts. Firstly, the animals were given an injection of 0.12 ml per kilo of toxin and two hours later, when the blood sugar level had reached its highest level, a dose of 1.3 units of Insulin Toronto was injected intramuscularly for each 2 kilograms in weight of the rabbits. When given in this manner insulin has the effect of lowering the blood sugar level. Another similar insulin injection, four hours after the toxin, continued to lower the blood sugar level. The animal died about 30 hours after receiving the toxin in contrast to the control animal which died in 6 hours when no insulin was given.

The second part of the experiment consisted of administering 1.3 units of insulin per 2 kilograms of body weight followed immediately by the toxin. After giving the same dose of toxin, injections of 1.3, 0.65, 0.325 units of insulin per 2 kilograms were given hourly to separate rabbits for four hours.

TABLE 6

THE EFFECT OF INSULIN

Insulin Treatment	Vol. Toxin 0.12 ml per Kilo	Blood Sugar in Mg Percent						Death in Hours After Toxin Injection
		Normal Value	Hours After Toxin Injection					
			1	2	3	4	5	
Control Toxin Only	0.36 ml	107	145	204	254	—	—	6 hours
1.3 U/2 Kilo 2 & 4 hours after Toxin	0.35	115	226	300	260	238	204	<30 hours
Initially Insulin 1.3 U/2 Kilo Was Injected with the Toxin and the Following Doses were Injected After the Blood Sampling for 4 Hours.								
1.3 U/2 Kilo per hr.	0.4 ml	114	106	53	52	45	37	Survived
0.65 U/2 Kilo per hr.	0.38 ml	110	77	107	107	90	99	<24 hours
0.325 U/2 Kilo per hr.	0.43 ml	115	80	80	134	107	140	75 hours.

The initial injection of insulin prevented an increase in the blood sugar level on the administration of toxin. The injection of 0.65 units per 2 kilograms each hour maintained the animal at its normal blood sugar level but the animal died in less than 24 hours. The blood sugar level gradually went up in the animal receiving an hourly injection of 0.325 units of insulin per 2 kilograms and it died in approximately 75 hours. Finally in the animal which received injections of 1.3 units per 2 kilograms the blood sugar level went steadily down in the five-hour test period to less than half its normal level. In all cases the administration of insulin lowered the blood sugar level and the degree of control depended on the dosage of insulin administered. It may be noted that the last animal which received more than adequate insulin to control the hyperglycaemic effect of the toxin survived while the control rabbit receiving no insulin died in 6 hours. The other rabbits receiving less insulin also survived much longer than the control. Further investigations on the protective action of insulin therapy will be reported in a later publication.

SUMMARY

Observations are presented which show that small doses of staphylococcal beta-toxin administered intraperitoneally produce a condition of hyperglycaemia in the rabbit. Larger doses are required and the response is slower if the toxin is administered intramuscularly. The action of the toxin is specific and animals may be protected from the hyperglycaemic and lethal effects of the toxin by immunization with toxoid or by prophylactic use of antitoxin. Antitoxin administered as treatment is not effective in controlling the hyperglycaemia or in preventing the death of the animal. The hyperglycaemia may be reduced by administration of insulin. Adequate doses of insulin,

administered prophylactically and in treatment, will control this hyperglycaemia and may prevent death of the animal.

The author wishes to acknowledge the technical assistance of W. D. Harrison in carrying out these experiments.

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6. Nicholson, T. F.: Dept. of Pathological Chemistry, Univ. of Toronto. Personal Communication.

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Ontario Public Health Association

and

Canadian Institute of Sanitary Inspectors
(Ontario Branch)

ROYAL YORK HOTEL, TORONTO

OCTOBER 6 - 8, 1955

Canadian Journal of Public Health

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CANADIAN AVERAGE WEIGHTS

A RED card with white lettering has recently been made available by the Nutrition Division of the Department of National Health and Welfare to professional people. The average weights on the card are one of the first results of a survey conducted in 1953 by the Division (1). A sample was carefully drawn by the Dominion Bureau of Statistics to represent the Canadian population with an accuracy of 5 per cent, and randomized so that everyone in Canada had an equal chance of being included. Almost 22,000 men, women and children, in their indoor clothes but without shoes, were weighed and measured by a trained staff.

The resulting table of averages is believed to be the first one in the world representing an entire population obtained in such a way. The figures are being used not only by physicians and nurses, but also by manufacturers of garments, household equipment, etc.

What is a proper interpretation of these figures? Are they "ideal" or "desirable"? The answer is that the new Canadian averages provide a standard or reference point that is much clearer in its derivation and significance for the population than any previous figures.

Some variation has always been permitted from the figures in a weight table. One widely-used insurance table lists weights for three types of body "frame" at each height and sex, but without defining "frame"; it then lists two figures under each type without instructions on when to use the lower, and the higher figure. This presentation has been useful in allowing some latitude in each category but to use it properly would require definitions and judgment. Similar judgment has been used in referring to tables giving a single weight for height, age and sex, presumably the "ideal" weight and it is customary to allow five, ten or even twenty per cent of the figure given, above or below, according to the purpose in mind.

Similar adjustments can be applied to the new table of Canadian average weights, with the added advantage that the starting point (the weight in the table) has a clear relationship to the population. It is therefore much better than figures derived in unknown ways or from limited groups. Thus if a diabetic specialist considers that patients should maintain weight 10 per cent

below the AVERAGE CANADIAN WEIGHT, it is just as easy for him to recommend it as to use any other standard. He has the additional information from the average that more than half the people in the particular age-sex-height group, weigh more than the weight he has selected (10 per cent below the figure in this table). Conversely, if a person asks a physician whether she must gain weight up to the figure in the table of AVERAGES, he has an excellent opportunity to explain that an average is a kind of mid-point, with many people normally below and above.

Is a person overweight if they are above average? They may be. There is increasing evidence that "overweight" by itself as judged from older tables by the use of 10 or 20 per cent additions, is not as significant in the leading cause of death, cardiovascularrenal disease, as combining a consideration of weight with a measurement of subcutaneous tissue (the skinfold measurement). Such a measurement was made in the Canadian Weight-Height Survey, and the resulting figures will be of great interest in this connection, when they are released. They will permit a new kind of evaluation of weight in terms of low, average or high values for subcutaneous fatty tissue. Such fat is currently considered to be more harmful than excess muscular tissue or a large skeletal mass. This seems likely to become a valuable clinical and research tool, especially as it can be related to the Canadian population rather than to tables of uncertain derivation.

Our objective should be to control weight at any age to whatever figure *near the average* gives the person a feeling of well-being, rather than to some rigid standard of unrepresentative origin.

L. B. Pett

1. A Canadian Table of Average Weights. Canad. M.A.J. 1955, *72*, 12–14.

A Message from the President of the Canadian Public Health Association

IT has been many years since Alberta had the opportunity to welcome the Canadian Public Health Association. It is suitable that the timing of the convention places it on the week when the Province of Alberta is at the very peak of its Jubilee celebration. On September 1, 1905, Alberta started out as a province and the high point of the commemoration of that occasion will be reached at Edmonton on September 7, 1955, the middle day of our convention. This is an additional reason for us in Alberta to issue a special welcome and to hope for a very large attendance.

The program this year contains such well known names as The Honourable Paul Martin, Minister of National Health and Welfare; Dr. Hart E. Van Riper, Medical Director of the National Foundation for Infantile Paralysis; Dr. A. E. Berry of the Sanitation Division in Ontario and Dr. R. G. Birrell of the Imperial Oil Health Services. It is our hope that this convention may be an opportunity for the consolidation of our thinking, for the presentation of new ideas and for the general exchange of information.

We are pleased to have with us the Second Canadian Medical Care Conference. This year, it is planned to have a general session with them on the morning of Thursday, September 8, covering certain medical care problems in which the general public health group should be interested. On Friday, September 9, the medical care group will continue following the closing of the Public Health Convention. I am sure that members of our association will be welcome on that day.

Alberta has much to offer in addition to the convention. One would hope that visitors from outside the province would not leave without a look at our expanding industry and at some of our glorious scenery. Jasper, Banff and Waterton are very well known. Many other points are well worth a visit.

It will be our pleasure to welcome you here next September.

A. Somerville

Program

FORTY-THIRD ANNUAL MEETING

OF THE

Canadian Public Health Association

IN CONJUNCTION WITH THE

Alberta Public Health Association

MACDONALD HOTEL

EDMONTON

SEPTEMBER 6, 7 AND 8, 1955

Directory of Sessions

MONDAY, SEPTEMBER 5

7–10 p.m.—The Alberta Public Health Association is arranging a welcoming party for all coming to Edmonton for the convention.

TUESDAY, SEPTEMBER 6

8.30 a.m.—Registration. A fee of $2.00 will be charged to cover, in part, the expenses of the meeting. Every delegate is expected to register.

9.15 a.m.—Alberta Public Health Association Business Meeting.

9.45 a.m.—FIRST GENERAL SESSION

12.30 p.m.—Luncheon. Speaker: The Hon. PAUL MARTIN, Minister of National Health and Welfare.

2.00 p.m.—Section Meetings:

Vital and Health Statistics **Epidemiology**	Combined Session
Public Health Nursing **Industrial Health**	Combined Session
Public Health Education	
Sanitation	
Public Health Administration	
Dental Public Health	

7.00 p.m.—Evening Section Meetings: **Sanitation**

7.30 p.m. **Health Education**

7.30 p.m. **Public Health Nursing**, **Industrial Health** — Combined Session

7.30 p.m.—Annual Meeting of the Executive Council.

WEDNESDAY, SEPTEMBER 7

9.00 a.m.—SECOND GENERAL SESSION

12.00 noon—Alberta Public Health Association Business Meeting.

1.30 p.m.—Section Meetings: **Vital and Health Statistics**, **Medical Care Group** } Combined Session

2.00 p.m.— **Public Health Administration**, **Public Health Nursing**, **Industrial Health** } Combined Session

Health Education, **Dental Public Health**, **Sanitation** } Combined Session

6.30 p.m.—President's Reception.

7.30 p.m.—Annual Dinner. Speaker: DR. E. P. SCARLETT, Chancellor of the University of Alberta.

THURSDAY, SEPTEMBER 8

9.00 a.m.—THIRD GENERAL SESSION

1.45 p.m.—THIRD GENERAL SESSION continued

2.00 p.m.—Second Canadian Medical Care Conference.

3.00 p.m.—Tour of the Oilfields—Courtesy of Imperial Oil Limited, Edmonton.

7.00 p.m.—Medical Care Business Meeting.

FRIDAY, SEPTEMBER 9

SECOND MEDICAL CARE CONFERENCE

Sessions beginning at 9 a.m. and 2 p.m.

Preliminary Program

MONDAY, SEPTEMBER 5, 7–10 p.m.

The Alberta Public Health Association is arranging a welcoming party for all coming to Edmonton for the convention.

TUESDAY, SEPTEMBER 6, 9.15 a.m.

ALBERTA PUBLIC HEALTH ASSOCIATION BUSINESS MEETING

TUESDAY, 9.45 a.m.

FIRST GENERAL SESSION

Presiding: Dr. A. Somerville, Deputy Minister of Health, Province of Alberta, and President of the Association.

A Physician Looks at Fluoridation.

DR. JAMES M. MATHER, Professor of Preventive Medicine, University of British Columbia, Vancouver.

Greetings from the Honourable W. W. CROSS, M.D., Minister of Health, Province of Alberta, Edmonton, and His Worship WM. HAWRELAK, Mayor of the City of Edmonton.

Symposium: **MENTAL HYGIENE IN PRACTICE**

DR. H. SIEMENS, Medical Officer of Health, MR. J. A. MacDOUGALL, Psychologist, MISS RUTH McCLURE, Sr. Nurse, Leduc-Strathcona Health Unit, Edmonton.

TUESDAY, 12.30 p.m.

LUNCHEON

Presiding: DR. A. SOMERVILLE, Deputy Minister of Health, Province of Alberta, and President of the Association.

Address: **Federal Health Grants**

THE HONOURABLE PAUL MARTIN
Minister of National Health and Welfare, Ottawa.

Tickets will be on sale at the Registration Desk. Early reservations will be desirable, as the accommodation is limited.

TUESDAY, 2.00 p.m.

PUBLIC HEALTH ADMINISTRATION SECTION

Personal Relations of a Health Officer.

DR. D. M. BLACK, Medical Officer of Health, South Central Health Unit, Kamloops, B.C.

Problem of Distance and Transport in Public Health Bacteriology.

DR. R. D. STUART, Director, Provincial Laboratory, Edmonton.

Rheumatic Fever Prophylaxis.

DR. P. B. PEACOCK, Regional Medical Officer of Health, Moose Jaw, Saskatchewan.

TUESDAY, 2.00 p.m.

SECTIONS OF PUBLIC HEALTH NURSING AND INDUSTRIAL HEALTH
(Combined Session)

Behaviour Problems in Normal Children.

MISS RUTH McCLURE, Sr. Nurse, Leduc-Strathcona Health Unit, Edmonton.

Mental Hygiene in Industry.

Speaker to be announced.

Public Health Nursing Business Meeting.

TUESDAY, 2.00 p.m.

PUBLIC HEALTH EDUCATION SECTION

Safety Education (demonstration).
MR. CHRISTIAN SMITH, Director of Health Education, Regina, Saskatchewan.

Dental Health Education.
MR. R. GOODACRE, Director of Health Education, Victoria, B.C.

TUESDAY, 2.00 p.m.

SANITATION SECTION

Symposium: **RESTAURANTS**

(a) **Restaurant Design**—F. BARRIGAN, Barrigan Woodwares Manufacturers, Edmonton.
(b) **Restaurant Inspection:**
(1) **What to Look For**—NORMAN BRUCE, Food Inspector, City of Calgary.
(2) **Method of Securing Correction of Defects**—DR. C. G. R. MORE, Medical Officer of Health, Red Deer Health Unit.

TUESDAY, 2.00 p.m.

SECTIONS OF VITAL AND HEALTH STATISTICS AND EPIDEMIOLOGY

Certain Epidemiological Aspects of Neurotropic Virus Infections in Saskatchewan.
DRS. H. O. DILLENBURG, MURRAY S. ACKER, Department of Public Health, Regina, DR. R. J. P. BELCOURT, School of Hygiene, University of Toronto and DR. F. P. NAGLER, Department of National Welfare, Ottawa.

Reporting of Notifiable Diseases.
DR. E. H. LOSSING, Chief, Epidemiology Division, Department of National Health and Welfare, Ottawa.

The Alberta Perinatal Mortality Study.
DR. L. C. GRISDALE, University of Alberta, Edmonton.

TUESDAY, 2.00 p.m.

DENTAL PUBLIC HEALTH SECTION

Program to be announced.

TUESDAY, 7.00 p.m.

SANITATION SECTION

Food Handler Education.
C. E. HORNABY, Sanitary Inspector, Health Department, City of Edmonton.
Open Forum.

TUESDAY, 7.30 p.m.

PUBLIC HEALTH EDUCATION SECTION

Program to be announced.

TUESDAY, 7.30 p.m.

SECTIONS OF PUBLIC HEALTH NURSING AND INDUSTRIAL HEALTH

(Combined Session)

Program to be announced.

TUESDAY, 7.30 p.m.

ANNUAL MEETING OF THE EXECUTIVE COUNCIL

Presiding: DR. A. SOMERVILLE, Deputy Minister of Health, Province of Alberta, and President of the Association.

WEDNESDAY, SEPTEMBER 7, 9.00 a.m.

SECOND GENERAL SESSION

Trends in Industrial Health Programs.
DR. R. G. BIRRELL, Medical Director, Imperial Oil Limited, Toronto.

Progress in the Control of Paralytic Poliomyelitis through Vaccination.
DR. HART E. VAN RIPER, Medical Director, National Foundation for Infantile Paralysis, New York.

Growing Viruses–illustrated wfth Motfon Pictures
DR. R. D. DEFRIES, Director, School of Hygiene and Connaught Medical Research Laboratories, University of Toronto.

Sanitary Engineering in Canada.
DR. A. E. BERRY, Director of Public Health Engineering, Ontario Department of Health, Toronto.

WEDNESDAY, 12 noon

ALBERTA PUBLIC HEALTH ASSOCIATION BUSINESS MEETING

WEDNESDAY, 1.30 p.m.

VITAL AND HEALTH STATISTICS SECTION AND SECOND CANADIAN MEDICAL CARE CONFERENCE (Combined Session)

Business Meeting of Vital and Health Statistics Section.

Symposium: **CANADIAN SICKNESS SURVEY**
Summary of Results and Implications for Public Health
Moderator—DR. F. W. JACKSON, Director of Health Services, Department of National Health and Welfare, Ottawa.

Participants:

Family Expenditures on Medical Care—DR. C. L. FRANCIS, Research Division, Department of National Health and Welfare, Ottawa.

The Volume of Illness—DR. R. KOHN, Chief, Public Health Statistics Section, Health and Welfare Division, Dominion Bureau of Statistics, Ottawa.

Utilization of Health Services—DR. MURRAY S. ACKER, Director, Research and Statistics, Department of Public Health, Regina, Saskatchewan.

Summary and Implications—Speaker to be announced.
Business Session—Election of officers, resolutions, etc.

WEDNESDAY, 2.00 p.m.

SECTIONS OF PUBLIC HEALTH ADMINISTRATION, PUBLIC HEALTH NURSING AND INDUSTRIAL HEALTH (Combined Session)

Symposium: **ROUND THE CLOCK WITH PUBLIC HEALTH**

Family and Environmental Health.
MISS ELECTA MacLENNAN, Director of School of Nursing, Dalhousie University, Halifax.

Mental Health.
DR. A. R. SCHRAG, Clinic Psychiatrist, Division of Mental Health, Guidance Clinic, Edmonton.

Integration of Occupational Health Services into Public Health.
DR. M. P. G. RAWLINSON, Medical Officer, Occupational Health Division, Department of National Health and Welfare, Ottawa.

Rehabilitation.
DR. J. R. FOWLER, Medical Director, Workmen's Compensation Board, Edmonton.

Closer Co-operation Between Hospitals and Community Health Services.
MISS JEANIE S. CLARK, Director of Nursing, University of Alberta Hospital, Edmonton.

WEDNESDAY, 2.00 p.m.

SECTIONS OF PUBLIC HEALTH EDUCATION AND DENTAL PUBLIC HEALTH

(Combined Session)

HOW AND HOW NOT TO ENCOURAGE A COMMUNITY TO COMMENCE FLUORIDATION.

Panel:

DR. FRANK KOHLI, Director of Dental Services, Ontario Department of Health, Toronto.

DR. J. HOWIE, Medical Officer of Health, Windsor, Ontario.

DR. A. B. SUTHERLAND, Dental Director, Sudbury, Ontario.

MR. CHRISTIAN SMITH, Director of Health Education, Regina.

Television as a Medium in Health Education.
Speaker to be announced.

WEDNESDAY, 2.00 p.m.

SANITATION SECTION

Water: (a) **Evaluation and Interpretation of Chemical Analysis of Water.**
(b) **Disinfection of Town Water Distribution System.**
DR. D. R. STANLEY, Consultant Engineer, Edmonton.

Minimum Standards Acceptable for School Sanitation.
H. BOWNES, Sanitary Inspector, Red Deer Health Unit.

Interpretation of Apparent Variations in Results of Various Milk Tests.
DR. J. B. LINNEBOE, Bacteriologist, Dairy Branch, Department of Agriculture, Edmonton.

WEDNESDAY, 6.30 p.m.

PRESIDENT'S RECEPTION

WEDNESDAY, 7.30 p.m.

ANNUAL DINNER

Tickets will be on sale at the Registration Desk. They will not be available at the door.

Address:
DR. E. P. SCARLETT, Chancellor of the University of Alberta.

THURSDAY, SEPTEMBER 8, 9.00 a.m.

THIRD GENERAL SESSION

conjointly with

SECOND CANADIAN MEDICAL CARE CONFERENCE

Presidential Address: DR. A. SOMERVILLE.

Alberta Medical Insurance Plan.
THE HONOURABLE W. W. CROSS, M.D., Minister of Health, Province of Alberta, Edmonton.

An Experience in the Co-ordination of Health Services.
DR. V. MATTHEWS, Regional Medical Health Officer, Swift Current, Saskatchewan.

Alberta Hospitalization Plan.
DR. M. G. McCALLUM, Director, Division of Hospital and Medical Services, Department of Public Health, Edmonton.

Canadian Public Health Association Business Meeting—Reports of the Committees on Nominations and Resolutions.

THURSDAY, 1.45 p.m.

THIRD GENERAL SESSION (continued)

Pesticides and Public Health.

DR. KINGSLEY KAY, Chairman, National Health Pesticide Committee, Occupational Health Laboratory, Department of National Health and Welfare, Ottawa.

THURSDAY, 2.00 p.m.

SECOND CANADIAN MEDICAL CARE CONFERENCE

Programme to be announced.

THURSDAY, 3.00 p.m.

Tour of the Oilfields—Courtesy of Imperial Oil Limited, Edmonton.

THURSDAY, 7.00 p.m.

SECOND MEDICAL CARE CONFERENCE BUSINESS MEETING

FRIDAY, SEPTEMBER 9

SECOND MEDICAL CARE CONFERENCE

Sessions at 9 a.m. and 2 p.m.
Program to be announced.

Edmonton—The Convention City

EDMONTON, which has been host to bands of Crees trading furs, to gold seekers heading for the Klondike trails, to American Army engineers building a great northern road, and to petroleum executives and engineers developing the rich Alberta oil fields, welcomes members of the Canadian Public Health Association to the forty-third annual meeting which will take place at the MacDonald Hotel, September 6, 7, and 8.

From convention headquarters in the MacDonald Hotel, members will be able to see Edmonton thoroughly during their visit. They will find the city a swiftly developing centre of retail and wholesale trade, of industry, of aviation, and of government administration.

Edmonton is the capital of Alberta, a fact that for the past fifty years has linked the city with the development of the Province. Fifty years ago the Province of Alberta came into being near the present Renfrew Park. More than 12,000 crowded Edmonton streets to watch the inauguration parade file under the evergreen-trimmed arches and flamboyant bunting that proclaimed Edmonton's pride at being selected the capital of the new Province of Alberta.

The city emerged from a series of fur trading posts established on the North Saskatchewan River by the Hudson's Bay Company and the North West Company. The first of these forts was established by the Hudson's Bay Company around 1794 and there was still a Fort Edmonton when the Company transferred its rights over Rupert's Land to the Government of Canada in 1869.

Courtesy Canadian National Railways

Macdonald Hotel, Edmonton, Alta.

A Methodist Mission formed the beginnings of Alberta's capital city. Two claims were staked in 1870 by Rev. George McDougall in an area about a block west of the present MacDonald Hotel. This mission property, together with a few other claims staked by Scottish settlers and 1,000 acres of land around Fort Edmonton reserved to the Hudson's Bay Company, defined the original settlement that became a town in 1892.

In 1898, the river town became the jumping off point for prospectors taking the inland route to the Klondike. At Edmonton, the rails ended and the gold seekers trudged north on the arduous overland trek to Dawson City. Outfitting the prospectors stimulated business in Edmonton while many of the prospectors returning from the goldfields broke and disillusioned took jobs in the town, eventually taking up permanent residence.

In 1905, the same year that Alberta was formed as a Province out of the North West Territory, Edmonton was incorporated as a city. Its municipal area was increased in 1912 by the amalgamation of the City of Strathcona, on the south side of the river. This former city, now known as the South Side, has retained a distinctive identity and is the fastest growing residential area of Edmonton at present.

Courtesy Alberta Government

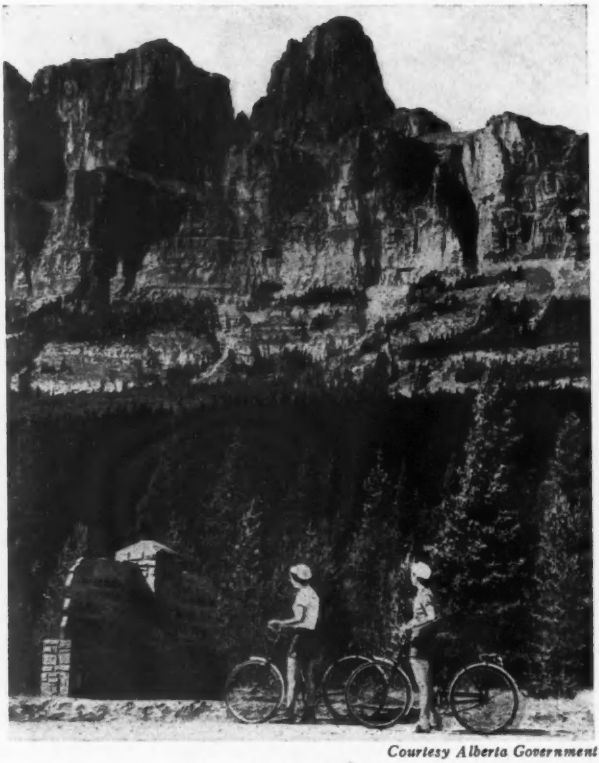
Legislative Building, Edmonton, Alta.

Edmonton and its people have always been enthusiastic over aviation. Its municipal airport, formed in 1919 by a far-sighted civic administration, was the first licensed commercial airfield in Canada. Then 160 acres in area, it now has 16 hangars, and three runways a mile long in a 750 acre area. Conveniently adjacent to downtown Edmonton and central to most residential districts, the $14,000,000 Edmonton airport serves six major airlines, local commercial flying operations, and occasional requirements of the R.C.A.F. and the U.S.A.F.

Edmonton has always been linked with the north. From its railhead, the early Klondikers hiked north and from its airfield, bush pilots flew into the far reaches of northern Canada on incredible trail-blazing flights. In 1942, Edmonton became an important American base for the Alaska Highway, the great northern road that became essential to the defence of the North American continent from the Japanese. Although the highway proper begins at Dawson Creek, B.C., Edmonton always has been linked with the history and development of the long road link between the United States and Alaska.

Oil has been the latest force to affect Edmonton's development. Nearly all of northern Alberta's oilfields are close to the capital and the city has served as an operational base for the large oil development concerns whose expenditures have meant so much to the provincial economy since 1947. In that year, Edmonton emerged as an oil city; Leduc-Woodbend was the first field discovered but it was soon joined by Redwater, Golden Spike, Bonnie Glen, Pembina and others. Today, Alberta has 5,350 oil wells that produce an average of 273,584 barrels of crude daily.

The convention visitor has much to see in Edmonton. A tour of the nearby Leduc oilfields, and the bustling petrochemical area on Edmonton's eastern



Courtesy Alberta Government

Mount Eisenhower, Junction of the Windermere and Banff Jasper Highways

suburbs are practically standard items on any convention program. A scenic tour of the city will give the visitor an excellent impression of Edmonton as a whole; the Saskatchewan River valley and the gardens and grounds of the Legislative Buildings are beautiful in early September.

For those with more specific interests, the Alberta Department of Health offices and the Edmonton Health Department welcome professional visits. The Honourable W. W. Cross, M.D., Alberta Minister of Health, Dr. A. Somerville, his deputy, and other departmental officials may be found in the Administration Building of the Alberta Government on 109th St., while Dr. G. M. Little, Edmonton Medical Officer of Health, may be visited at the Edmonton Civic Building.

The Provincial Laboratory of Public Health, a fine modern scientific institution, is located on the University of Alberta campus. Interesting medical facilities exist in the University Hospital and the Aberhart Sanatorium, both which are in the University area, the Workmen's Compensation Board rehabilitation clinic, the Northern Alberta Cerebral Palsy Clinic, and the Charles Camsell Hospital.

Within driving distance of Edmonton is much of scenic value. Elk Island Park, about 30 miles east of Edmonton, is the last accessible place in Canada where one can watch plains buffalo graze in a natural preserve. Jasper National Park and Banff National Park are more distant, but still only a day's drive from Edmonton. These parks offer such inspiring views as the Columbia Icefield, Lake Louise, Mount Eisenhower, the Vermilion Lakes, Mount Edith Cavell, Maligne Lake, and Sunwapta Falls.

EMPLOYMENT SERVICE

Advertisements regarding "positions available" and "personnel available" will be published in from one to three consecutive issues, depending upon the requirements of the agency or person concerned. They are limited to seventy words or less, with a confidential box number if desired. There is no charge for this service to members of the Association. Health agencies are charged a flat rate of $10.00 for the advertisements (up to four consecutive issues) and for the service. The rate for non-members is $5.00. The service includes confidential clearing of information between prospective employer and employee if desired.

Sanitary Inspector required for generalized program in health unit. Excellent working conditions, pension plan, Blue Cross and P.S.I. available. Car allowance. Write to Dr. Charlotte M. Horner, Medical Officer of Health, Northumberland-Durham Health Unit, Cobourg, Ontario. 6–7

Public Health Nurse with experience, preferably trained in Ontario. Good personnel policies, car provided, in-service training related to treatment and care of orthopaedic patients. Apply, stating age, to Supervisor of Nursing, Ontario Society for Crippled Children, 92 College Street, Toronto, Ontario. 6–7

Sanitary Inspector, qualified, bilingual, required by Prescott and Russell Health Unit. Minimum salary $2600, with allowance for previous experience and annual increments. Five day week, car allowance, Blue Cross and sick leave. Apply to Dr. R. G. Grenon, Director, Prescott and Russell Health Unit, Hawkesbury, Ontario.

Bacteriologist for senior position in the Ontario Public Health Laboratory Service. Medical or major degree in science with laboratory experience required. Address: Deputy Minister, Ontario Department of Health, Toronto 2, Ontario.

Sanitary Inspector required for generalized program with the Bruce County Health Unit. Minimum salary $2700, with allowance for experience. Pension and Blue Cross plans available. Car allowance 9¢ per mile. Apply to T. H. Alton, Secretary-Treasurer, Bruce County Health Unit, Walkerton, Ontario.

Sanitary Inspector required by Dufferin County Health Unit. Salary according to experience. Pension plan pending. Compensation insurance benefits. Annual leave. Annual increments according to ability. Apply to Board of Health, Orangeville. 6–9

Public Health Nurses for generalized program (bedside nursing included). Minimum salary $2700, with allowance for previous experience. Annual increments. Cumulative sick plan. Blue Cross available. Interest free loans for purchasing cars if necessary. Transportation allowance. One month holiday at the end of one year. Apply to Dr. J. I. Jeffs, Lennox and Addington County Health Unit, Memorial Building, Napanee, Ontario. 6–9

Qualified Public Health Nurses required by Department of Public Health, City of Toronto, for generalized Public Health Nursing Service. Salary range $3186 to $3618. Starting salary based on experience. Annual increments, five day week, vacation, sick pay and pension plan benefits. Apply to Personnel Department, Room 320, City Hall, Toronto. 6–7

Public Health Nurses for generalized program, minimum salary $2700 with allowance for previous experience and annual increments. Pension, Blue Cross and Windsor Medical Services. Apply to Dr. W. H. Johnston, Medical Officer of Health, City Hall, Chatham, Ontario.

Public Health Nurses required for generalized program in Seaway Development Area. Group insurance and Blue Cross available. Good transportation policy. Minimum salary $2700 with allowance for experience. Apply to Dr. R. S. Peat, Medical Officer of Health, Stormont, Dundas and Glengarry Health Unit, 104 Second Street West, Cornwall, Ontario. 6–7